Studies on Olividae. X.

The taxonomic status of *Oliva esiodina* Duclos, 1844, *O. duclosi* Reeve, 1850 and *O. lentiginosa* Reeve, 1850.

B. Tursch
Collectif de Bio-écologie, Faculté des Sciences,
Université Libre de Bruxelles,
50 avenue F.D. Roosevelt, 1050 Brussels, Belgium.

D. Greifeneder
August-Bebel Str. 65, 7730 Villingen-Schwenningen, West.Germany.

ABSTRACT: *Oliva duclosi* Reeve, 1850 and *O. lentiginosa* Reeve, 1850 are junior synonyms of *O. esiodina* Duclos, 1844. Their shell characters overlap and could not be separated by morphometric analysis.
RESUME: *Oliva duclosi* Reeve, 1850 et *O. lentiginosa* Reeve, 1850 sont des synonymes plus récents de *O. esiodina* Duclos, 1844. Les caractères de leur coquille présentent des recouvrements et ne peuvent être séparés par analyse morphométrique.

KEYWORDS: Molluscs, Gastropods, Olividae, *Oliva, duclosi, esiodina, lentiginosa,* taxonomy.
MOTS-CLEFS: Mollusques, Gastéropodes,Olividae, *Oliva, duclosi, esiodina, lentiginosa,* taxonomie.

1. INTRODUCTION.

The names *Oliva esiodina* Duclos and *O. lentiginosa* Reeve have been utilized in the two latest revisions of the genus *Oliva* (ZEIGLER & PORRECA, 1969 and PETUCH & SARGENT, 1986) for shells apparently bearing little resemblance to the type specimens. This prompted us to re-examine the old problem of the identity of these taxa, together with that of the well-known *O. duclosi* Reeve.

The shells under discussion are illustrated in Figs. 1 and 2. Useful photographs of type material of the three names are also given with short comments by KAICHER (1988) (Card 5175: *O. lentiginosa* with the comment "Compare with *esiodina*" and the locality "Ryu-Kyu Is. - Philippines". Card 5241: *O. duclosi* with the locality "Polynesia"; Card 5255: *O. esiodina* with the locality "Okinawa".

2. HISTORY.

2.1. Converging opinions.

DUCROS de SAINT GERMAIN (1857) cites *O. esiodina* under the synonymy of *O. duclosi* Reeve (Species 35, p. 58) and gives the following comment: "*Ol. esiodina*, Duclos, est une variété à spire élevée et très-conique, pâle, épaisse, à bord droit très-épaissi...". He also considers *O. lentiginosa* as a synonym, with the comment: "*Ol. lentiginosa* Reeve est une

Figs. 1 and 2. Dorsal and ventral view respectively. 1. *Oliva esiodina* Duclos, 1844: figured syntype (from a series of 2), MNHN (H: 32.2 mm), "Iles de l'Océanie". 2. *Oliva lentiginosa* Reeve, 1850: syntype, BMNH-1892.9.24.2 (H: 33.9 mm), locality unknown. 3. *Oliva lentiginosa* Reeve, 1850: syntype, BMNH-1892.9.24.3 (H: 30.4 mm), locality unknown. 4. specimen DG-1731/c (H: 17.7 mm). Tahiti, Hitiaa, 3 m. 5. specimen BT-3688 (H: 29.10 mm).Tahiti, Hitiaa, 3 m. 6. specimen DG-6892/1 (H: 24.7 mm). Locality doubtful. 7. specimen BT-6045 (H: 28.4 mm), Tahiti, Matavai Bay, black sand. 8. specimen BT-4674 (H: 27.9 mm), Tahiti, Mahina, 15-25 ft, black sand. 9. specimen BT-5298 (H: 25.3 mm), Tahiti, Matavai Bay, black sand. 10. *Oliva duclosi* Reeve, 1850: syntype, BMNH-1987006/a (H: 25.3 mm). "Philippine Islands (Isle of Luzon + Society Islands)". 11. *Oliva duclosi* Reeve, 1850: syntype, BMNH-1987006/b (H: 28.8 mm). "Philippine Islands (Isle of Luzon + Society Islands)". 12. specimen BT-6043 (H: 27.9 mm), Tahiti, Hitiaa, 1 m.

coquille pâle; il suffit de regarder attentivement la columelle pour se convaincre que ce n'est qu'une variété de *Ol.Duclosi*. On trouve fréquemment des individus qui sont mi-partie *Duclosi*, mi-partie *lentiginosa*." The author insists on the variability of ***O. duclosi*** and its consequences: "Pour cette espèce si jolie et si caractéristique, la sagacité de M. Reeve a été mise en défaut. Il suffit, en effet, d'avoir 6 ou 8 individus bien choisis pour opérer les réunions que nous proposons. Quant à Duclos, il a agi selon son habitude.". *O. jaspidea* Duclos, *O. natalia* Duclos, *O. stainforthi* Reeve and *O. duclosiana* Jay are also listed as synonyms.

WEINKAUFF (1878) cites (p.81) *O. esiodina* in the synonymy of *O. duclosi* Reeve and refers to DUCROS in his comments. The author gives a separate description (p.86) for *O. lentiginosa* but comments "Ist der *O. Duclosi* verwandt, vielleicht hatte Ducros Recht, sie dieser Art als Varietät mit aufgelöster Zeichnung anzufügen".

DAUTZENBERG (1927) in the section devoted to *Oliva duclosi* Reeve, describes (p.14) a *var. esiodina* Duclos as "Coquille très épaisse à spire exceptionnellement élevée, que nous ne connaissons que par les figures de Duclos, dont l'une a été reproduite par Tryon. Sa coloration est très claire et son dessin peu apparent". He also refers to a *var. lentiginosa* Reeve, unknown to him from New Caledonia and occurring in "Oshima, Japon (Hirase); Golfe du Bengale, d'après Théobald".

BURCH & BURCH (1960 and 1967) also consider *O. esiodina* and *O. lentiginosa* (together with *O. stainforthi*) as synonyms of *O. duclosi*.

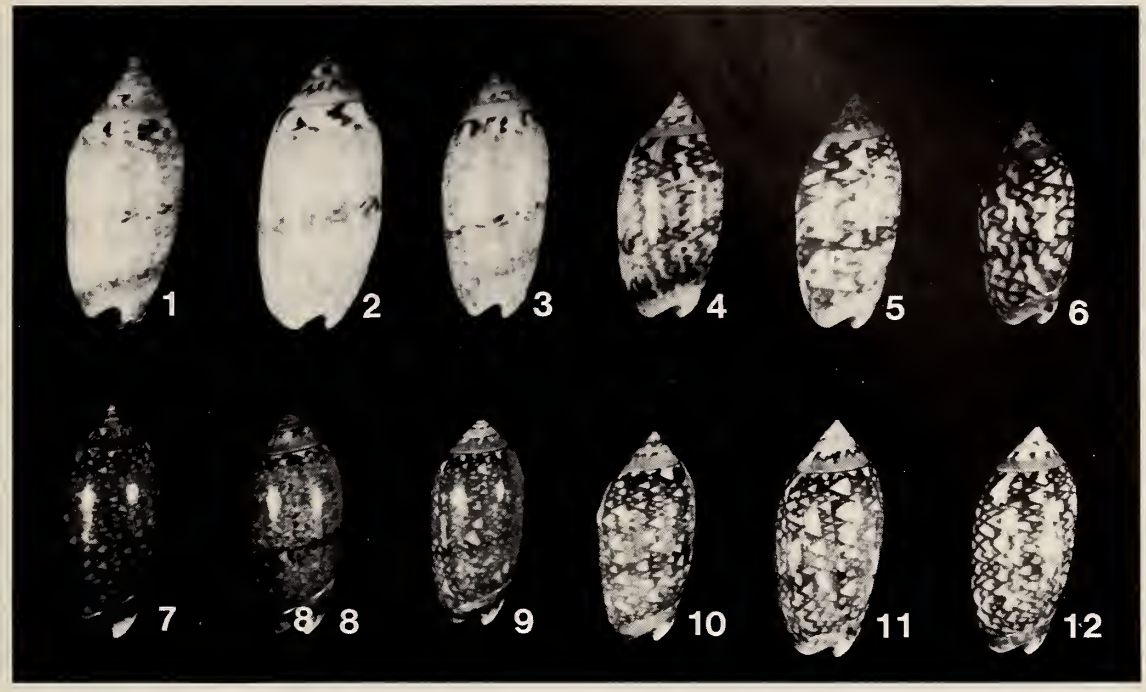
2.2. Diverging opinions.

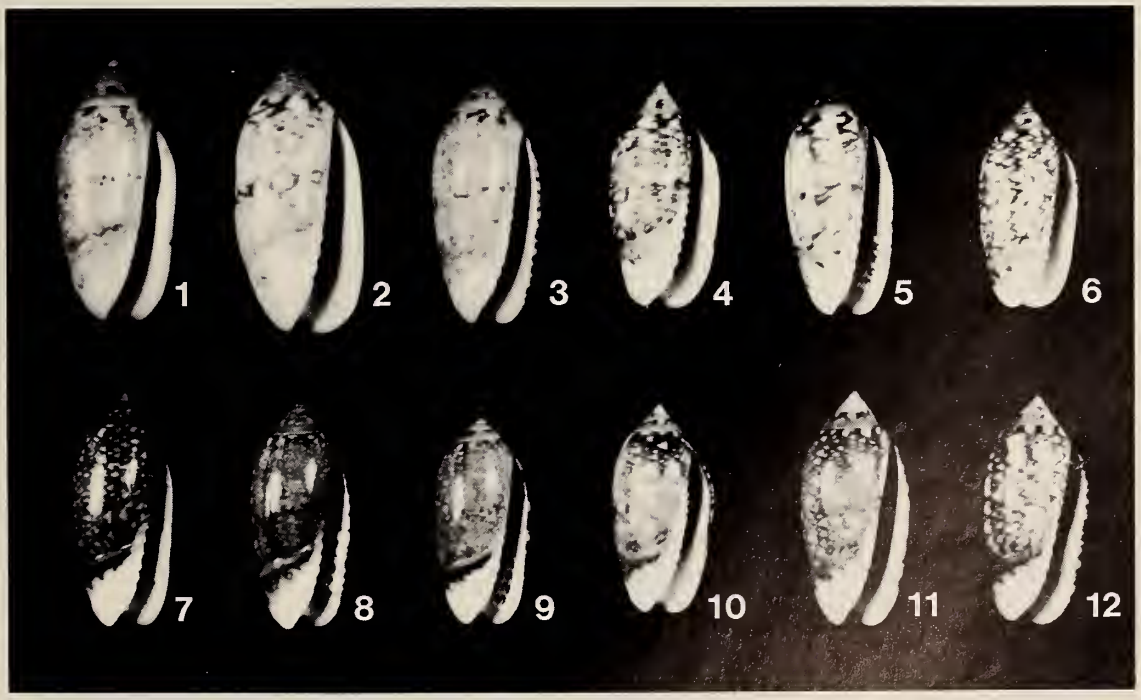
ZEIGLER and PORRECA (1969) illustrate a very different-looking shell under the name *O. duclosi esiodina* Duclos, 1844 (p.55, Pl.10, fig.27), implying subspecific rank. The authors then described it as *forma esiodina* Duclos, 1844 (p. 70) with the comment: "A questionable form and difficult to identify ..." then continue by citing the hereabove comments of DAUTZENBERG (1927).

PETUCH & SARGENT (1986) offer a completely different interpretation, reporting two small Western Pacific shells (at first sight reminiscent of the "*O. panniculata*" group) as *Oliva (Acutoliva) lentiginosa* Reeve (p.62, Pl.1, figs. 7,8) and *Oliva (Acutoliva) esiodina* Duclos, 1835 (*sic*) (p.60, Pl.1, figs. 15,16).

3. METHOD.

The purpose of this paper is to compare a series of "*O. duclosi*" (17 specimens) first with three syntypes of *O. duclosi* (just to make certain one is dealing with the right species), then with the figured syntype of *O. esiodina* and two syntypes of *O. lentiginosa* and finally to attempt drawing conclusions on their similarity.


1
2
3
4
5
6
7
8 8
9
10
11
12


1
2
3
4
5
6
7
8
9
10
11
12

It is generally much easier to demonstrate that series of biological objects *are different* than to establish that they *have a high probability to be identical* (which is the best one can do). Such conclusions should be based on verifiable facts and not be a matter of personal inclination. The "facts" (characters) given in worded descriptions of most *Oliva* shells are often quite subjective and are hardly appropriate for such delicate rulings. For instance, the spire of the same specimen of *O. esiodina* is "*fort longue*" for DUCLOS, simply "*élevée*" for DUCROS and becomes "*exceptionnellement élevée*" for DAUTZENBERG. Numerical methods based upon accurate shell measurements would certainly constitute a more objective basis for comparison.

It is also worth discussing how numerical data should be interpreted. Standard statistical comparison methods (such as the STUDENT's T-test) are not useful when one of the samples to be compared is very small, as it is the case here. We have thus preferred (see TURSCH & HUART, 1988) to establish the experimental variation range (expressed as the 95 % or 99 % confidence interval) for every measured variable in the large series, then to check whether the data of every individual to be compared is included or not in this natural variation range (reasonably assumed to have a Gaussian distribution).

The existing type specimens provide material evidence and no mention will be made of the original descriptions or illustrations, all open to subjective interpretations.

Measurements. The shell measurements nw, pnw, spro, mpro, lpro, H, L, LW, D, X, R, F and FG have been decribed in detail in TURSCH & GERMAIN (1985), res4 and res5 in TURSCH & GERMAIN (1986), pat14, pat16, pat17 and pat18 in TURSCH & GERMAIN (1987). For a quick reminder, nw is the number of volutions of the protoconch and pnw is the number of postnuclear whorls. Both can be measured within 0.05 whorl. The meaning of the other measurements is summarily sketched in Fig.3

4. MATERIAL EXAMINED.

BMNH refers to specimens from the British Museum (Natural History), London; MNHN to specimens from the Muséum National d'Histoire Naturelle, Paris. DG- numbers refer to the Dietmar Greifeneder collection, RF-numbers to the Ralph Duchamps collection, BT-numbers to the Bernard Tursch collection. The sign (+) indicates the presence of an intact protoconch, (+/-) of a partially damaged protoconch still allowing some measurements, (-) of a completely damaged protoconch.

TYPE MATERIAL:

Oliva esiodina Duclos: figured syntype, MNHN (+/-), "Iles de l'Océanie".

Oliva duclosi Reeve: 3 syntypes, BMNH-1987006/2 (+/-) BMNH-1987006/3 (+/-), BMNH-1987006/1 (+/-), "Philippine Islands (Isle of Luzon + Society Islands)".

Oliva lentiginosa Reeve: 2 syntypes, BMNH-1892.9.24.2 (+/-), BMNH-1892.9.24.3 (-), locality unknown.

ADDITIONAL MATERIAL:

Light-coloured specimens (3):

TAHITI. Hitiaa, 3 m, black sand: DG-1731/c (+).
No loc.: BT-3688 (+/-).
LOCALITY UNKNOWN: DG-6892/1 (+/-).

Dark-coloured specimens (20):

TAHITI. Arue, 3 m, black sand: DG-1728/b (+). Hitiaa, 6m, sand: DG-1730/a (+), DG-1730/B (+). Mahina, 15-25 ft, black sand: BT-4672 (+/-), BT-4673 (+/-), BT-4674 (+/-), BT-4675 (+/-). Matavai Bay, black sand: BT-5298 (+/-), BT-6045 (+/-), BT-6046 (+/-), BT-6047 (+/-), BT-6048 (+/-). Pirae: BT-3686 (+/-), BT-3687 (+). No loc.: BT-6042 (+/-), BT-6044 (+/-).
LOCALITY UNKNOWN: DG-6892/2 (+).

Intermediate specimens (3):

TAHITI. Hitiaa, 1 m, black sand: DG-1731/b (+).
No loc.: BT-6038 (+), BT-6043 (+/-)

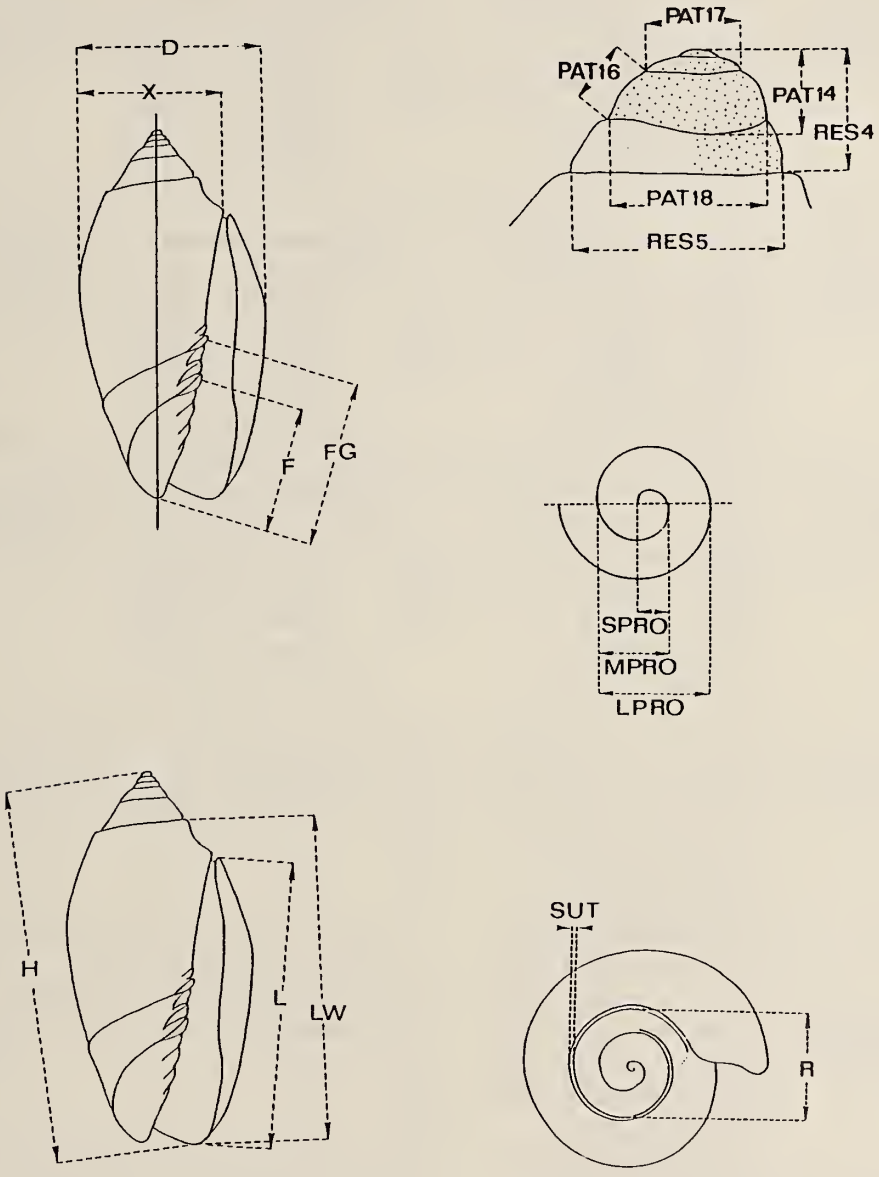


Fig. 3. Sketch of measurements utilized in this work.

Table 1: teleoconch shape data.

H/L	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	1.27	0.030	**1.21 - 1.33**			2.35 %
observed values:	*duclosi* (pale form):		1.26	1.28	1.31	
	duclosi (intermediate form):		1.26	1.26	1.30	
	duclosi (syntypes):		1.26	1.28	1.30	
	esiodina (syntype):			1.35		
	lentiginosa (syntypes):			1.27	1.30	
D/L	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	0.58	0.021	**0.54 - 0.63**			3.51 %
observed values:	*duclosi* (pale form):		0.59	0.62	0.62	
	duclosi (intermediate form):		0.58	0.59	0.61	
	duclosi (syntypes):		0.60	0.61	0.62	
	esiodina (syntype):			0.62		
	lentiginosa (syntypes):			0.58	0.59	
X/L	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	0.47	0.017	**0.44 - 0.50**			3.58 %
observed values:	*duclosi* (pale form):		0.46	0.47	0.48	
	duclosi (intermediate form):		0.46	0.47	0.48	
	duclosi (syntypes):		0.47	0.48	0.49	
	esiodina (syntype):			0.50		
	lentiginosa (syntypes):			0.45	0.48	
R/L	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	1.34	0.022	**0.29 - 0.38**			6.68 %
observed values:	*duclosi* (pale form):		0.32	0.34	0.36	
	duclosi (intermediate form):		0.32	0.35	0.34	
	duclosi (syntypes):		0.33	0.36	0.36	
	esiodina (syntype):			0.38		
	lentiginosa (syntypes):			0.33	0.35	
LWL	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	1.11	0.016	**1.08 - 1.14**			1.46 %
observed values:	*duclosi* (pale form):		1.09	1.11	1.12	
	duclosi (intermediate form):		1.07	1.10	1.11	
	duclosi (syntypes):		1.10	1.11	1.12	
	esiodina (syntype):			1.11		
	lentiginosa (syntypes):			1.10	1.14	

Table 1 (continued).

F/L	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	0.48	0.015	**0.45 - 0.51**			3.13 %
observed values:	*duclosi* (pale form):		0.48	0.48	0.49	
	duclosi (intermediate form):		0.46	0.47	0.47	
	duclosi (syntypes):		0.47	048	0.49	
	esiodina (syntype):			0.48		
	lentiginosa (syntypes):			0.55	0.62	
FG/L	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	0.57	0.030	**0.51 - 0.63**			5.21 %
observed values:	*duclosi* (pale form):		0.54	0.56	0.59	
	duclosi (intermediate form):		0.53	0.54	0.54	
	duclosi (syntypes):		0.56	0.59	0.59	
	esiodina (syntype):			0.57		
	lentiginosa (syntypes):			0.55	0.62	
(H-L)/L	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	0.27	0.030	**0.21 - 0.33**			10.94 %
observed values:	*duclosi* (pale form):		0.26	0.29	0.31	
	duclosi (intermediate form):		0.26	0.26	0.30	
	duclosi (syntypes):		0.26	0.28	0.28	
	esiodina (syntype):			0.35		
	lentiginosa (syntypes):			0.27	0.30	

Table 1. The reference form of *O.duclosi* (dark form) consists of 17 specimens. Two values occur outside the 95 % confidence interval and are underlined. Both are well within the 99 % confidence interval, as discussed in the text.

5. RESULTS.

The experimental data are presented in Tables 1, 2 and 3. With two exceptions (underlined in the tables), all the values fall well within the 95% confidence interval of the reference sample (dark form of *O. duclosi*).

The exceptions are:

1. H/L for the syntype of *O. esiodina* (Table 1). The observed value (1.35) is within the 99 % confidence range of the reference sample (calculated: 1.18-1.36).

2. LW/L for one specimen of the intermediate color form of *O. duclosi* (Table 1). The observed value (1.07) is within the 99 % confidence range of the reference sample (calculated: 1.06-1.16).

Computer-assisted search over a series of 91 characters and their pairs (for a list of these characters, see TURSCH & HUART, 1988) also failed to provide any bivariant discriminants. For some variables, the shell colouration appears correlated with minor shape trends (see Fig. 4 for an example) but no clear separation could be achieved.

6. CONCLUSION.

6.1. Identity. None of the data indicates the existence of a significant morphological gap. As already sensed by DUCROS de SAINT GERMAIN (1857), WEINKAUFF (1878), TRYON (1883), DAUTZENBERG (1927) and BURCH & BURCH (1960 and 1967), *O. esiodina* , *O. duclosi* and *O. lentiginosa* are colour forms of the same shell. We found no objective data to challenge their opinion.

Table 2: protoconch data.

res5 (in mm)	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	1.03	0.034		**0.96 - 1.09**		3.38 %
observed values:	*duclosi* (pale form):		1.00	1.04	1.07	
	duclosi (intermediate form):		0.97	1.03	1.08	
	duclosi (syntypes):		1.02	1.05	1.05	
	esiodina (syntype):			1.09		
	lentiginosa (syntype):			0.97		
pat18 (in mm)	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	0.80	0.027		**0.74 - 0.85**		3.41 %
observed values:	*duclosi* (pale form):		?	0.77	0.78	
	duclosi (intermediate form):		0.80	0.80	0.82	
	duclosi (syntypes):		0.76	0.78	0.79	
	esiodina (syntype):			?		
	lentiginosa (syntype):			0.76		

Table 2. The reference sample of *O. duclosi* (dark form) consists of 17 specimens. The protoconchs of the syntypes of *O. duclosi* , *O. lentiginosa* and *O. esiodina* is severely damaged and do not allow other measurements than those given here.

Table 3: growth pattern data.

(log H) / pnw	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	0.62	0.025		**0.57 - 0.68**		4.02 %
observed values:	*duclosi* (pale form):		0.62	0.63	0.64	
	duclosi (intermediate form):		0.61	0.61	0.65	
	duclosi (syntypes):		0.62	0.63	0.64	
	esiodina (syntype):			0.63		
	lentiginosa (syntype):			0.64		
(log D) / pnw	mean	standard error	95% confidence interval			coeff. of variability
duclosi (dark form)	0.48	0.021		**0.43 - 0.52**		4.50 %
observed values:	*duclosi* (pale form):		0.48	0.49	0.50	
	duclosi (intermediate form):		0.47	0.47	0.50	
	duclosi (syntypes):		0.48	0.49	0.50	
	esiodina (syntype):			0.49		
	lentiginosa (syntype):			0.50		

Table 3. The reference form of *O. duclosi* (dark form) consists of 17 specimens. The number of postnuclear whorls (pnw) could be measured only one one of the two syntypes of *0. lentiginosa*, as the protoconch-teleoconch transition of the other one is severely damaged.

The co-occurrence of the forms in the same biotope (for instance in Tahiti, Hitiaa, in black sand) indicates they are not ecomorphs. Furthermore, continuous pattern intergradation seems to take place in series of shells (see Figs. 1,2), as stated by DUCROS de SAINT GERMAIN (1857).

6.2. Nomenclature. DUCROS de SAINT GERMAIN (1857) was the first to place *O. esiodina* in the synonymy of *O. duclosi* Reeve, 1850 and correctly observed that the older name *esiodina* should have priority over *duclosi* without however effecting a nomenclatural act in this sense. DUCROS justified the continued use of the name by saying of *esiodina:* "Ce nom a la priorité, mais il a été imposé spécialement à une variété peu répandue, et nous avons cru devoir préférer le nom de M.Reeve", an opinion shared by subsequent authors, amongst others DAUTZENBERG (1927). Much against our sentimental preferences, the rules of nomenclature cannot be bent according to relative rarity: the names *Oliva duclosi* Reeve, 1850 and *O. lentiginosa* Reeve, 1850 are subjective junior synonyms and should give place to *Oliva esiodina* Duclos, 1844. For convenience, the dark form common in French Polynesia could be called *O. esiodina* forma *duclosi* Reeve.

Oliva jaspidea Duclos, 1835 most probably refers to the same shell (we have examined the type material in the Muséum National d'Histoire Naturelle, Paris) and is the oldest name. It is not a primary homonym of *jaspidea* Gmelin, 1791 because this was originally described in the genus *Voluta*. It is however (International Code of Zoological Nomenclature, ed. 1985: Art. 53c) a secondary junior homonym because they were "subsequently published in combination with the same generic name" for instance by DUCROS de SAINT GERMAIN (1857) who explicitly replaces (p.58) *Oliva jaspidea* Duclos by *Oliva duclosi* Reeve. As this action was taken prior to 1961, the name *Oliva jaspidea* Duclos is permanently invalid (Code: Article 59b).

No type material could be located for *Oliva natalia* Duclos. The resemblance of the shell called *O. natalia* Duclos by PETUCH & SARGENT (1986, Pl.2, figs. 11, 12) to the original description and illustrations of DUCLOS seems at best debatable. DUCROS de SAINT GERMAIN (1857) says of this shell: "*Ol. natalia*, Duclos, est une *Ol. Duclosi* type, qui a été roulée et décolorée. La figure qu'il en donne a été grandie, rougie et embellie à plaisir". We found no reason to disagree with this opinion.

6.3. Redescription. The results hereabove call for *O. esiodina* Duclos to be redescribed in such a way as to account for its variability in colour pattern and shape.

Shape. This solid, subovate *Oliva* is of medium size (20 to 35 mm) with a breadth to length ratio of 0.47 to 0.57. The exserted spire has a straight conical profile and averages about 1/4 of the shell length. The protoconch is narrow and pointed. Its last whorl has an impressed line below the suture clearly shown on card 5255 of KAICHER (1988) (*Oliva duclosi* Reeve). The sutures are narrow. The inner lip has about 10 coarse, calloused columellar folds. The upper margin of the fasciolar band meets the inner lip at 34 to 40% of the total height of the shell (about 50% of the aperture height). The outer lip is thick and rounded, with a straight inner margin, nearly parallel to the shell axis.

Colour pattern. The ground colour of the shell is whitish to cream, as seen in the aperture. The pattern is light brown to dark grey-brown, depending on the amount of pigment and the thickness of the outer enamel layer. The smallest pattern elements are minute isocele triangles 1 to 3 mm in length, often forming rows. These rows are often arranged in chevrons that can in turn form axial zigzag patterns. On light and medium-coloured specimens these axial profiles appear clearly. On darker specimens the compact network of the pigmented pattern elements predominates: the overall appearance becomes dark grey with lighter triangular spots of different sizes.

In most shells, the body whorl has two spiral bands of darker colouration: one subsutural band of about 1 to 2 mm and one median band of about 1.5 mm. In the subsutural band the pigment is concentrated in a few, very dark pattern elements (strokes, chevrons, clusters) leaving between them larger areas of the light ground colour. The subsutural zone thus has a more contrasted aspect than the duller rest of the shell. The pattern of the median spiral band

Table 4: variation range of *Oliva esiodina* Duclos.

character	mean	standard error	95% confidence interval	coeff. of variability
Protoconch :				
nw (n = 8)	3.11	0.094	2.92 - 3.29	3.03 %
spro (mm) (n = 8)	0.21	0.020	0.17 - 0.25	9.69 %
mpro (mm) (n = 8)	0.38	0.027	0.32 - 0.43	7.19 %
lpro (mm) (n = 8)	0.58	0.027	0.53 - 0.64	4.63 %
res4 (mm) (n = 8)	0.69	0.035	0.62 - 0.76	5.07 %
res5 (mm) (n = 8)	1.03	0.036	0.96 - 1.10	3.51 %
pat14 (mm) (n = 8)	0.15	0.012	0.12 - 0.17	7.79 %
pat16 (mm) (n = 8)	0.31	0.017	0.28 - 0.35	5.54 %
pat17 (mm) (n = 8)	0.52	0.020	0.48 - 0.56	3.76 %
pat18 (mm) (n = 27)	0.79	0.034	0.72 - 0.86	4.24 %
Shape of Teleoconch :				
H / L (n = 29)	1.28	0.029	1.22 - 1.34	2.26 %
D / L (n = 29)	0.59	0.020	0.55 - 0.63	3.45 %
X / L (n = 29)	0.47	0.016	0.44 - 0.50	3.37 %
R / L (n = 29)	0.34	0.021	0.30 - 0.38	6.22 %
LW / L (n = 29)	1.11	0.016	1.08 - 1.14	1.46 %
F / L (n = 29)	0.48	0.013	0.45 - 0.51	2.77 %
FG / L (n = 29)	0.57	0.029	0.51 - 0.63	5.04 %
(H - L) / L (n = 29)	0.28	0.029	0.22 - 0.34	10.40 %
Growth of Teleoconch :				
(log H) / pnw (n = 28)	0.63	0.021	0.58 - 0.67	3.41 %
(log D) / pnw (n = 28)	0.48	0.019	0.44 - 0.52	3.86 %

Size :

Largest specimen measured: syntype of *O. lentiginosa* Reeve, BMNH 1892.9.24.2, locality unknown.
pnw: 5.55 ; H: 33.94 mm; L: 26.66 mm; D: 15.63 mm; X: 12.12 mm; R: 8.83 mm.

Smallest specimen measured: specimen DG-1728/b, Tahiti, Arue.
pnw: 5.25; H: 24.35 mm; L: 19.33 mm; D: 11.02 mm; X: 8.80 mm; R: 6.12 mm.

Table 4. The size of the available sample depends on the state of the specimens (mainly on protoconch damage) and is indicated by n.

differs from that of the body whorl only by the darker colouration of the strokes and chevrons and by the emphasis on the spiral rather than the axial connection between them.

The fasciolar band exhibits in its upper part the continuation of the usual pattern of the body whorl under a callus cover. At its lower border, the pigment concentrates into axial strokes and commas on a lighter background.

The earlier volutions of the spire exhibit on their upper third the contrasted pattern already mentioned for the subsutural zone. Their lower part is covered with an opaque enamel layer, which is cream in the light-coloured shells and light purplish-grey to dark purple in the darker specimens.

Numerical data. The "aesthetical" description hereabove respects the classical tradition of conchology. As usual, it is of limited utility because nearly every adjective is open to personal interpretation. In order to allow objective comparison with other taxa, the observed variation range of the shell morphology of *O. esiodina* is given in Table 4.

6.4. Distribution.

O. esiodina appears to have a typical Polynesian distribution and we have not seen authenticated specimens from Eastern Melanesia, where it is also alleged to occur (DAUTZENBERG, 1927 cites it from New Caledonia "*fide* Colonel Martel").

7. DISCUSSION.

The distinction of *O. duclosi*, *O. esiodina* and *O. lentiginosa* was based (amongst other features including the colour pattern) on the the relative heigth of the spire. It is indeed one of the most prominent characters classically utilized in *Oliva* taxonomy. This is expressed by (H-L)/L and one will notice in Table 4 that it is by far the most variable of the teleoconch characters. This has also been noticed in other cases (see TURSCH, GERMAIN & GREIFENEDER, 1986 and TURSCH & HUART, 1988) and we suspect this feature to be quite common. Great caution should be exerted in attempts to define taxa of *Oliva* on the base of this character.

One should emphasize that ancient authors often based new species upon gerontic or somewhat aberrant specimens. This is clearly the case for *O. esiodina* Duclos and *O. lentiginosa* Reeve, based upon old (gerontic ?) specimens. One will recall that light colours prevail in gerontic specimens of most *Oliva* species.

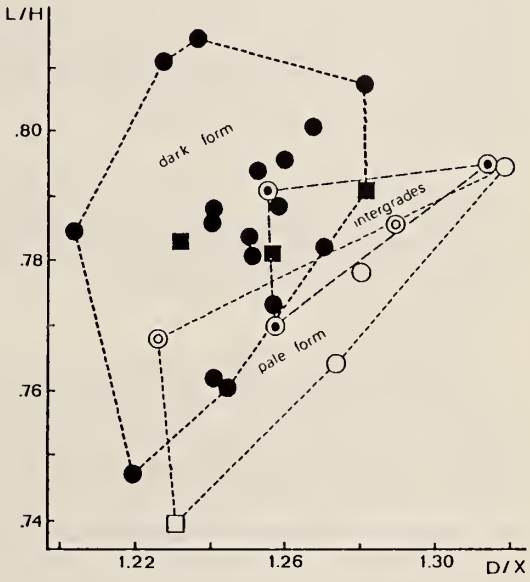


Fig. 4. Correlation between pattern and shape. Scatter diagram of L/H versus D/X. Black squares: syntypes of *O. duclosi* Reeve, 1850; Concentric circles: syntypes of *O. lentiginosa* Reeve, 1850; White square: figured syntype of *O. esiodina* Duclos, 1844.

The shell illustrated by ZEIGLER & PORRECA (1969) -and reported to be in the American Museum of Natural History, New York- probably belongs to the "*O. sidelia*" group and is indeed figured next to a series of shells referred by the authors to *O. sidelia*. Neither its colour pattern nor its shape suggests a close relationship with the shells studied here nor with that later described by PETUCH and SARGENT (1986) as *O. esiodina*.

The true *O. esiodina* is actually "described" (p.59) and illustrated (Pl.1, figs. 11 and 12) by PETUCH & SARGENT (1986) under the name *Oliva (Acutoliva) duclosi* color form *stainforthi* Reeve, 1850. This is astonishing because *Oliva stainforthi* Reeve is an unrelated, very distinct shell from the central Indian Ocean, entirely shining white with a few very characteristical purplish marks. The problem of *O. stainforthi* will be discussed elsewhere.

The two shells reported by PETUCH & SARGENT (1986) as *Oliva (Acutoliva) lentiginosa* Reeve, 1850 and *Oliva (Acutoliva) esiodina* Duclos, 1835 (*sic*) will be the object of a separate study.

Acknowledgements.

We are grateful to the Trustees of the British Museum (Natural History) for the loan of the type material of *O. duclosi* Reeve and *O. lentiginosa* Reeve; to Dr. Ph. Bouchet, Muséum National d'Histoire Naturelle, Paris, for the loan of the type material of *O. esiodina* Duclos, to Mr. R. Duchamps for the loan of specimens. We thank Mr. L. Germain and Mr. D. Huart for constructive criticism.

REFERENCES.

BURCH, J.Q. & R.L. BURCH, 1960. Catalog of recent and fossil Olives. Minutes of the Conchological Club of Southern California, Issue 196: 1-46, mimeographed.

BURCH, J.Q. & R.L. BURCH, 1967. The Family Olividae. Pacific Science 21(4): 503-522.

DAUTZENBERG, Ph. 1927. Olividés de la Nouvelle Calédonie et de ses dépendances. J. Conch. Paris 71(1): 1-147.

DUCLOS, P.L., 1844. *Oliva*. in J.C. CHENU, Illustrations conchyliologiques, Paris.

DUCROS de SAINT GERMAIN, A.M.P. 1857. Revue critique du genre *Oliva* de Bruguière. Ferdinand Thibaud, Clermont.

KAICHER, S.D., 1988. Card catalogue of worldwide shells. Pack 51: Olividae Part 2. St.Petersburg, Florida.

PETUCH, E.J. & D.M. SARGENT, 1986. Atlas of the Living Olive Shells of the World. 253 pp. Coastal Education and Research Foundation, Charlottesville, Virginia.

REEVE, L. 1850. Conchologia iconica or illustrations of the shells of molluscous animals. Monograph of the genus *Oliva*, pls. 1-30, London.

TRYON, G.W., Jr. 1883. Manual of Conchology, Ser. 1, vol. 5. Philadelphia.

TURSCH, B. & L. GERMAIN, 1985. Studies on Olividae. I. A morphometric approach to the *Oliva* problem. *Indo-Malayan Zoology*, 2: 331-352.

TURSCH, B. & L. GERMAIN, 1986. Studies on Olividae. II. Further protoconch morphometrical data for *Oliva* taxonomy. *Apex* 1(2): 39-45.

TURSCH, B. & L. GERMAIN, 1987. Studies on Olividae. V. Five additional protoconch characters for *Oliva* taxonomy. *Apex* 2(3-4): 59-68.

TURSCH, B., L. GERMAIN & D. GREIFENEDER, 1986. Studies on Olividae . III. Description of a novel subspecies: *Oliva bulowi phuketensis*. *Apex* 1(3): 71-87.

TURSCH, B. & D. HUART, 1988. Studies on Olividae. VII. Note on *Oliva dolicha* Locard, 1896, *Oliva flammulata* Lamarck, 1810 and *Oliva flammulata verdensis* Petuch & Sargent, 1986. *Apex*, 3(2-3): 47-54.

WEINKAUFF, H.C., 1878. Systematisches Conchylien-Cabinet. Vol.1, Part 1. Die Gattung *Oliva*. Nurenberg.

ZEIGLER, R.F. & H.C. PORRECA, 1969. Olive Shells of the World. 96 pp. Rochester Polychrome Press, Rochester.